

1) If : ${}^8P_r = 6720$, find : $\underline{{}_r+1} = \dots\dots\dots$

2) Evaluate : ${}^nP_0 + {}^nP_1 + {}^nP_2$ given that $\underline{{}_n+1} \div \underline{{}_n-1} = 72$

3) Prove that : ${}^nP_r = {}^{n-1}P_r + {}^{n-1}P_{r-1}$

4) Prove that ${}^nC_r : {}^{n-1}C_{r-1} = \frac{n}{r}$ then evaluate $\frac{{}^{25}C_4 + {}^{24}C_3}{{}^{24}C_3 + {}^{23}C_2}$

5) Find : ${}^nC_{7r+3}$ where ${}^nC_3 = 120$, ${}^nC_{r^2+2r} = {}^nC_{2r+5}$

6) Find $(x+2)^5 - (x-2)^5$

7) If the value of the middle term in the expansion of $(x + \frac{1}{2x})^{10}$ equals $\frac{28}{27}$, evaluate x.

8) Calculate the coefficient of x^5 in the expansion of

$$(\frac{x^2}{2} - \frac{3}{x})^{10}$$

9) Find with respect to the expansion $(x + \frac{3}{2x^2})^{12}$

- a) the coefficient of x^6
- b) the order of the term free of x

10) Let a, b be the two middle terms in the expansion of $(x - \frac{1}{x})^{15}$ according to the descending order of the power of x , prove that $a + b x^2 = 0$

11) prove that the expansion of $(x^2 + \frac{1}{x})^n$ includes a term free of x if n is multiple of 3, then find the term free of x when $n = 12$.

12) The ratio between the 5th . 6th terms in the expansion of $(x + \frac{2}{x})^8$ equals 25 : 8 evaluate x .

13) In the expansion $(3 + x)^n$ according to the descending order of the power of x , if $T_{10} = \frac{2}{3} T_9$, $T_{14} = 4 T_{15}$

14) T_3 , T_4 , T_5 in expansion $(x + y)^n$ are 112 , 448 , 1120 respectively , evaluate x , y , n

15) The ratio between T_2 , T_3 in $(A + B)^n$ equals the ratio Between T_3 , T_4 in $(A + B)^{n+1}$, find n

16) The ratio among the three coefficient of three consecutive terms in the expansion of $(1 + x)^n$ 15: 24: 28 , evaluate n , and find the order of these terms.

17) Consider the expansion $(2x + 23x)^n$. $T_9 = T_{10}$, the ratio of T_6 , T_7 equals 8 : 15 , find n , then prove that there exists no term free of x in this expansion.

18) find each of the middle term and the term includes x^{-3} in the expansion $(\frac{2x}{3} + \frac{3}{2x^2})^{12}$, if the ratio between these two terms is 7 : 9 find x

19) Find with respect to the expansion of $(4x^2 + \frac{1}{2x})^{15}$

- The coefficient of x^4
- The value of the term free of x
- The value of x which makes the two middle terms equal.

20) If $(2 - i)$ is one of the two roots of the equation $x^2 + bx + 1 = 0$ then find b .

21) If (-3) is a root of the equation $x^3 + x^2 - x + 15 = 0$, find the other two roots.

22) Solve the equation $2z + 3\bar{z} = 5$

23) If (-1) is a root of the equation $x^3 - x^2 + 2 = 0$ show that the other two roots are conjugate to each other.

24) Let $z_1 = 10 (\cos \theta + i \sin \theta)$, $z_2 = \frac{1}{2} (\sin 2\theta + i \cos 2\theta)$, $\tan \theta = \frac{3}{4}$, $0 < \theta < 90$, find the trigonometric and the algebraic form of the product $z_1 z_2$.

25) Find $\left(\frac{1-i}{1+i} \right)^4$

26) Put each of the numbers $\sqrt{2}i$, $1+i$ in the trigonometric form and use it to find $\left(\frac{\sqrt{2}}{1+i} \right)^4$

27) Find the square roots of the complex number $z = 2 + 2\sqrt{3}i$

28) Find the real values of x , y which satisfy the equation $(x+iy)^2(1+i) + 7 - 1 = 0$

29) If $(x+iy)^2 = \frac{11-i}{1+2i}$, find the real values of x , y .

30) If $x = \frac{1+i}{1-i}$, $y = \frac{1-i}{1+i}$, then find $(3x^{12} + 4y^{15})^{\frac{1}{2}}$

31) Solve the equation $x^2 - 2x + 4 = 0$

32) Prove that $(1 + \omega + 5\omega^2)(1 - 2\omega - \omega^2) = 18$

33) Prove that $\frac{3}{2}$ is one of the square roots of the equation

$$\left(\frac{1 + 10\omega - 10\omega^2}{1 - 3\omega - 3\omega^2} \right)$$

34) Prove that $\omega^2 - \omega = \pm \sqrt{3}$ hence evaluate:

$$\left(\frac{5 - 3\omega^2}{5\omega - 3} - \frac{2 - 7\omega}{2\omega^2 - 7} \right)^4$$

35) Prove that $(2 + 5\omega + 2\omega^2)^6 (2 + 2\omega + 5\omega^2)^6 = 729$

36) If $x = a + b$, $y = a\omega + b\omega^2$, $z = a\omega^2 - b\omega$ then prove that

a) $xyz = a^3 + b^3$

b) $x^2 + y^2 + z^2 = 6ab$

37) Form the quadratic equation whose roots are
 $(1 + \omega - \omega^2)^3, (1 - \omega + \omega^2)^3$

38) Show that:
$$\begin{vmatrix} x & a & a \\ a & x & a \\ a & a & x \end{vmatrix} = (x + 2a)(x - a)^2$$

39) Find k that makes x is a factor of
$$\begin{vmatrix} x & 1 & 0 \\ -3 & 2 & 3 \\ -x + k & 5 & x - k \end{vmatrix}$$

40) Evaluate
$$\begin{vmatrix} a^2 + 1 & ab & ac \\ ab & b^2 + 1 & bc \\ ac & bc & c^2 + 1 \end{vmatrix}$$

41) Evaluat
$$\begin{vmatrix} a_1 + ! b_1 & a_1 b_1 & c_1 \\ a_2 + ! b_2 & a_2 b_2 & c_2 \\ a_3 + ! b_3 & a_3 b_3 & c_3 \end{vmatrix}$$

